

Amp X

Smart Energy Summit 2021



Flexibility: Key for the Decarbonized Grid of the Future

- **Flexibility** will reduce peak energy usage, providing optionality to network operators, and avoiding the need for expensive grid reinforcements
 - ◆ Demand growth expected to recover to pre-crisis levels by 2023 and grow by a maximum of **9% by 2030**, driven by electrification of heat and transport
 - ◆ **£6bn** per annum of total UK flexibility market opportunity is projected by 2030 (National Infrastructure Commission, Smart Power Report)
 - ◆ Enhanced flexibility could save U.K. consumers alone as much as **£8bn** (€9.3bn) per year by 2030 (National Infrastructure Commission, Smart Power Report)
- System operators, regulators and legislators are focusing on **Non-Wire-Alternative (“NWA”)** sources of system flexibility:
 - Energy storage, interconnectors, smart network hardware and demand-side flexibility
 - **Less than 2% of the global potential for demand-side flexibility is currently being utilised** (IEA)



currently installed residential DERs across EU

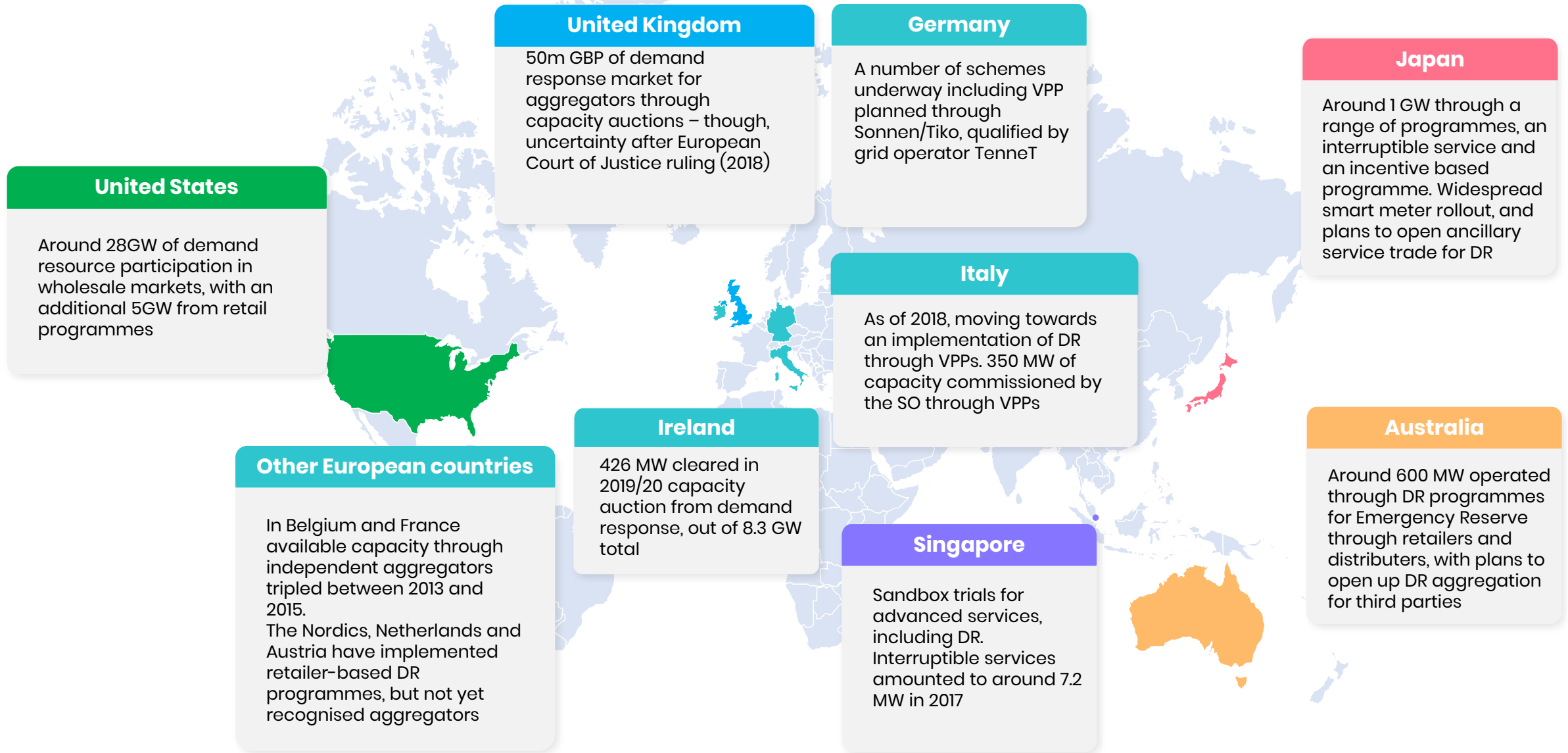


monetisable flexibility from the edge of the grid in Europe at present, of which only 1.5GW is being used

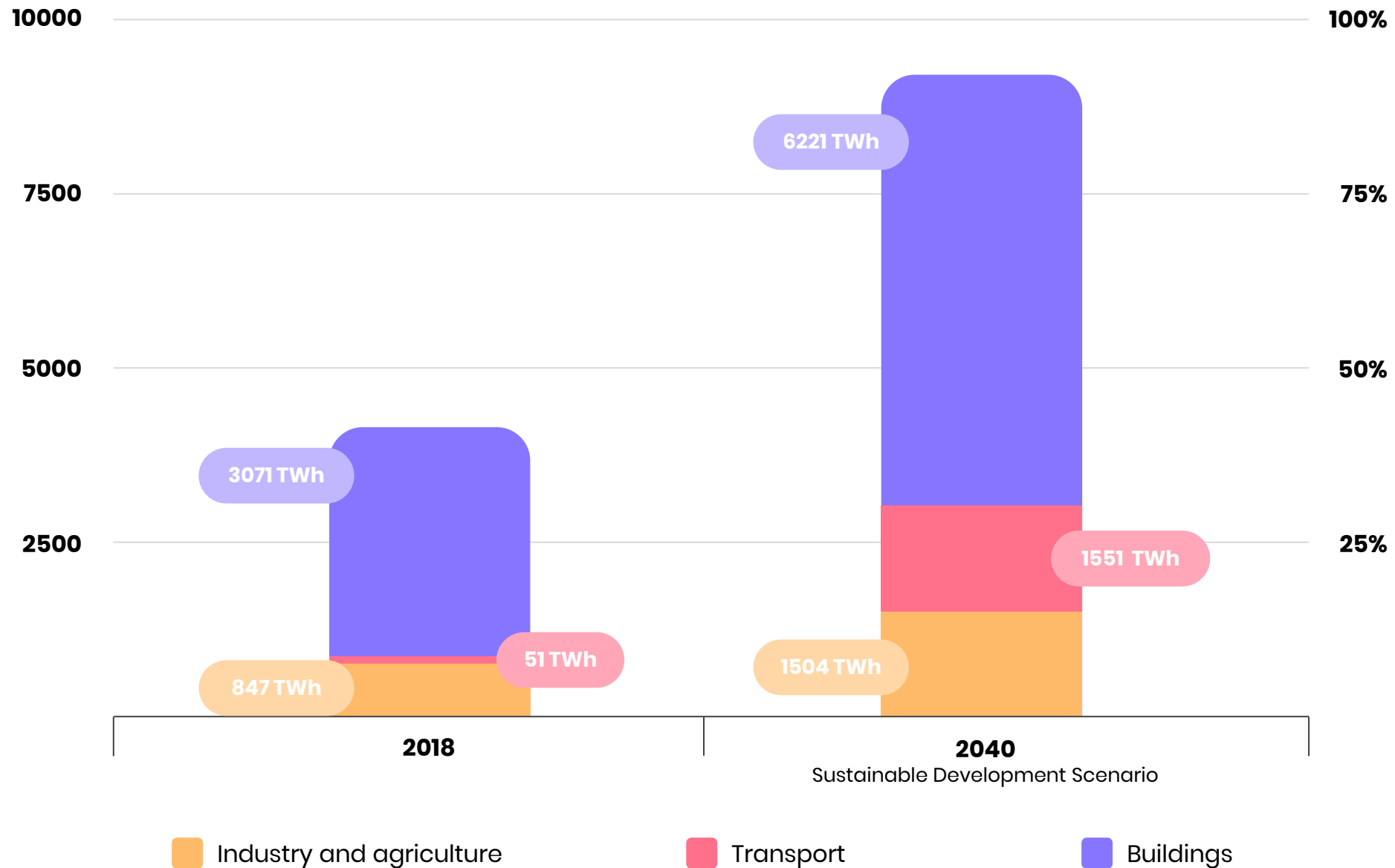


potential domestic flexibility in California could deliver \$15bn savings per annum by 2030

2020 Demand-Side Flexibility Initiatives



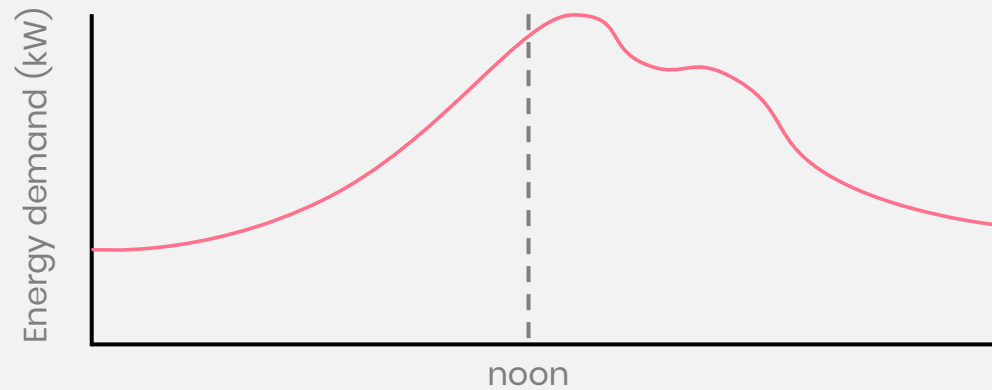
Demand-Response Potential 2018-2040



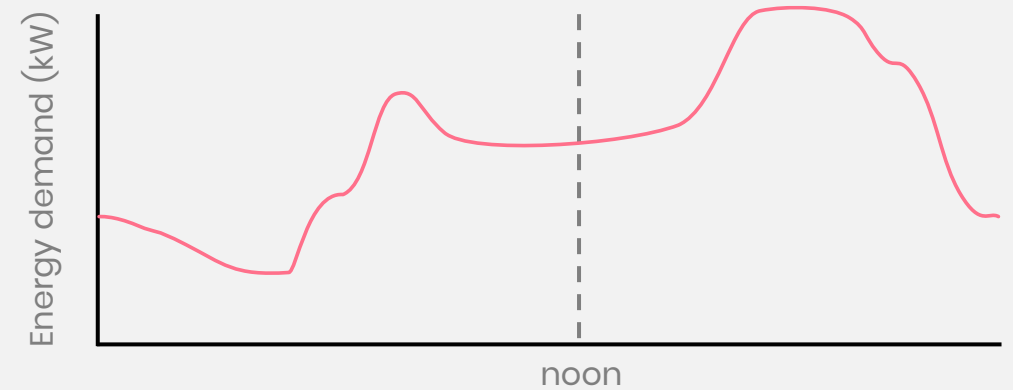
Commercial and Residential Buildings

Representative Load Profile

Commercial building



Residential household

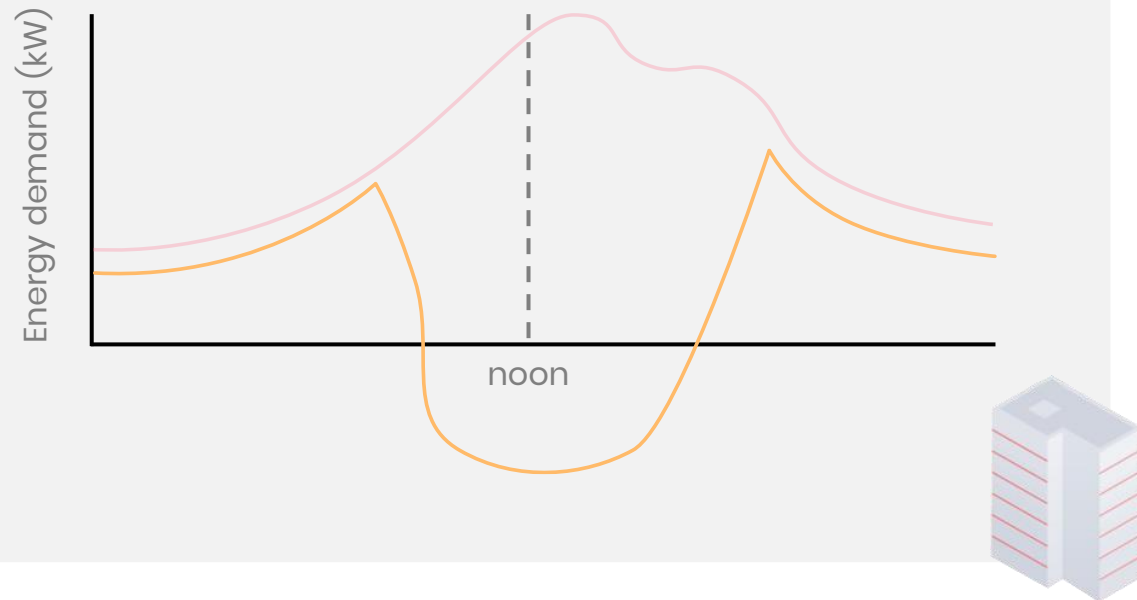


- Typical load profiles of commercial and residential buildings – demand peaks at different times during the day that can cause grid constraints and lack of resource adequacy
- Huge amount of untapped flexibility behind the meter

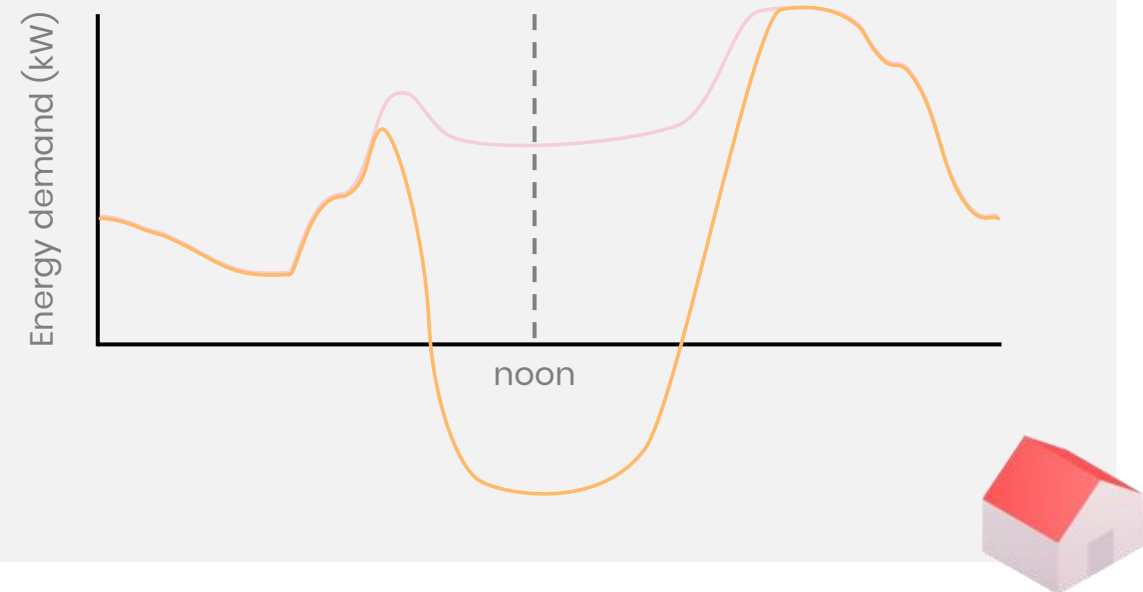
Commercial and Residential Buildings

Representative Load Profile

Energy efficient building + PV



Residential household + PV

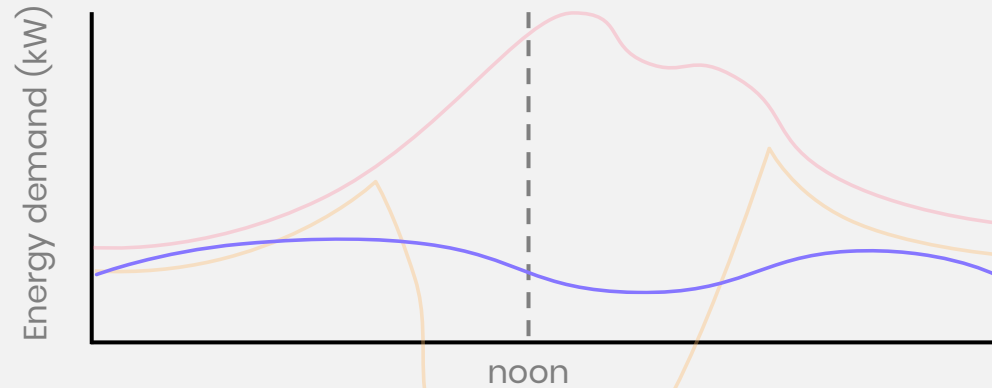


- Energy efficiency measures lowers load profile and reduces overall energy consumption
- Onsite solar PV generation helps offset loads but can exacerbate 'duck curve' and cause issues to utilities/power generators

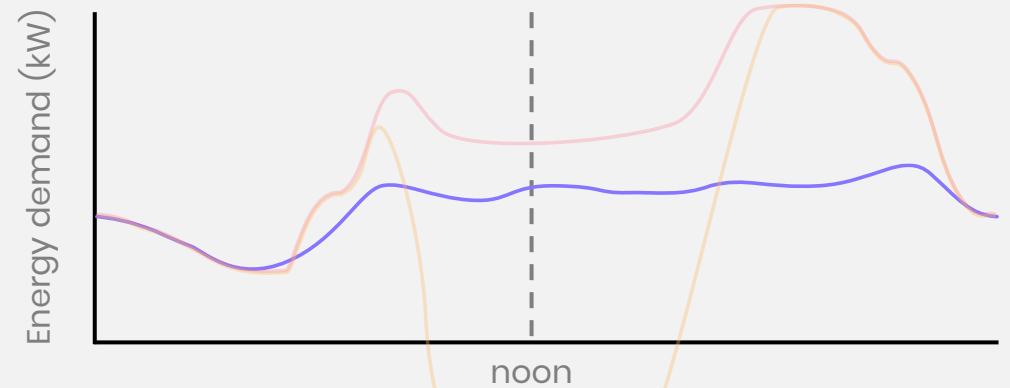
Grid Integrated Commercial/Residential Buildings

Representative Load Profile

Optimised energy efficient building



Optimised residential household

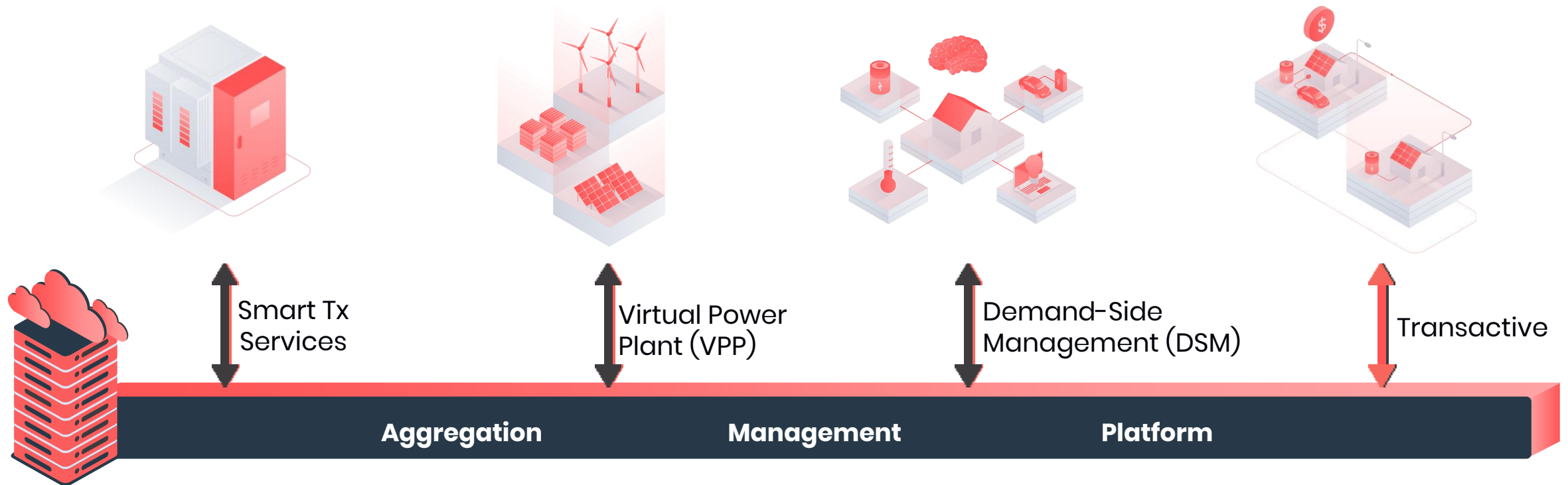


- They leverage an optimised mix of energy efficiency, storage, onsite generation and load flexibility, enabling a much flatter load profile
- Responsive assets - they can help accelerate decarbonisation and reduce supply-side investments
- They can be a significant source of demand-side flexibility and enable additional revenue streams through market participation

The Amp X Data-Rich Platform



- Amp X solutions are all catered by a single digital energy platform, the Aggregation Management Platform
- A data-rich digital energy platform enabling interoperability and unlocking flexibility at a massive scale
- A technology ecosystem fit for all evolutionary stages of the grid through the energy transition and beyond



Amp X Virtual Power Plant (VPP)

A first step towards a zero-carbon grid

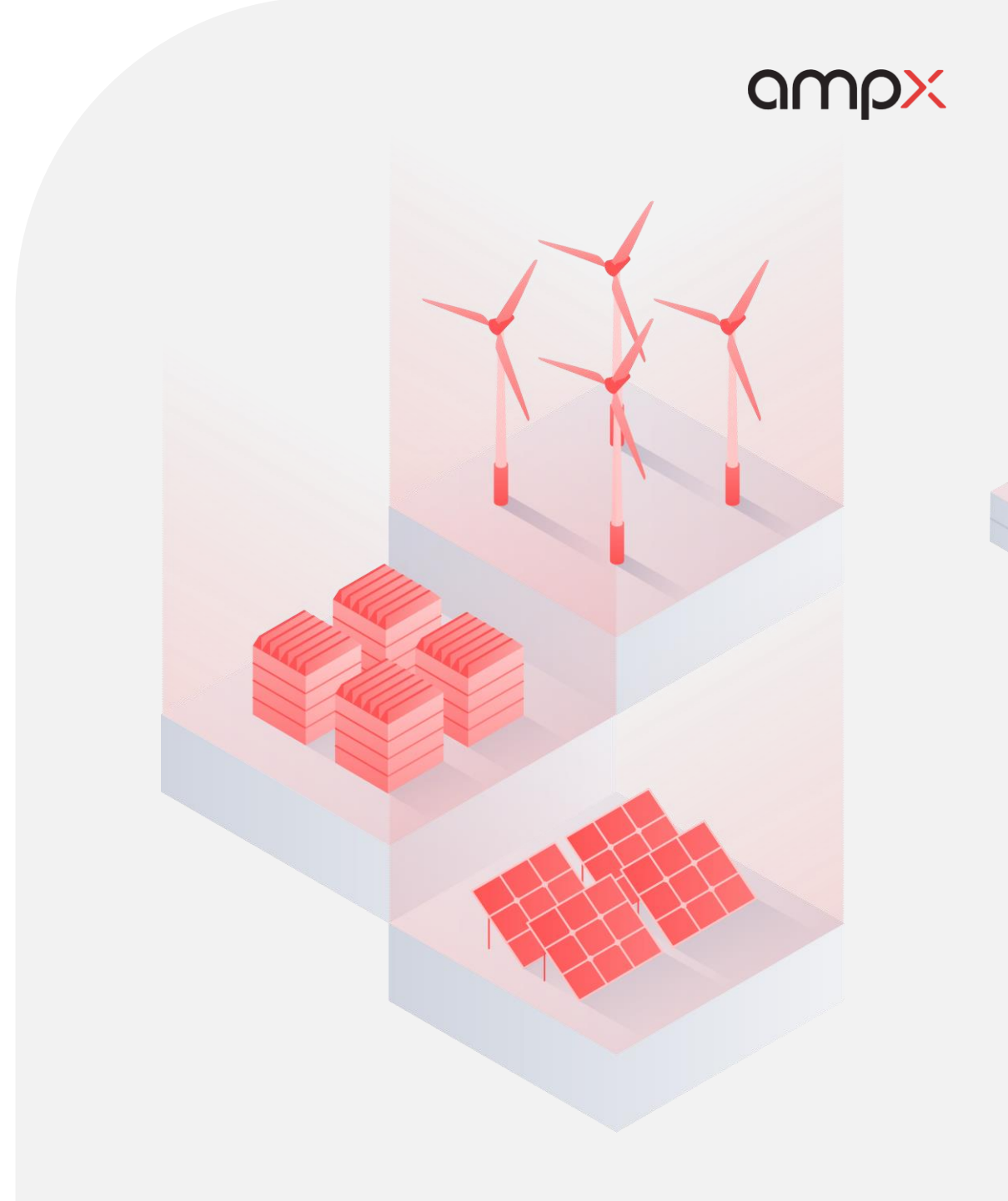
■ Aggregated groups of decentralised assets can participate in grid services

✓ **Advanced AI and ML technology**

✓ **Asset management**

✓ **Aggregation and dispatch optimisation**

✓ **Transactive ready**



Amp X Demand-Side Management (DSM)



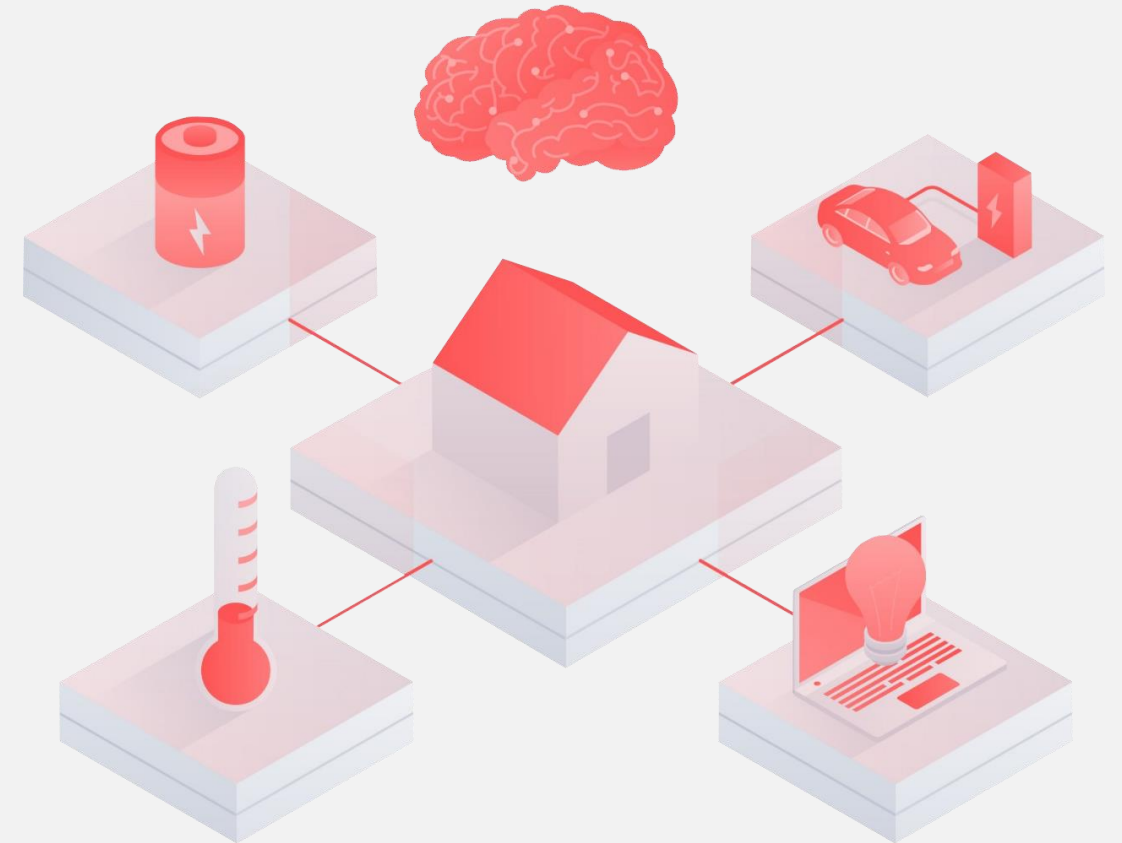
Demand-side flexibility at a massive scale

- Transactive-ready DSM, using behind-the-meter autonomy linked with advanced data analytics
- Millions of devices, such as rooftop PVs, home batteries, EV chargers, HVAC, pool pumps, washing machines etc., will be managed efficiently and transparently to the user, whilst providing aggregated flexibility to the grid

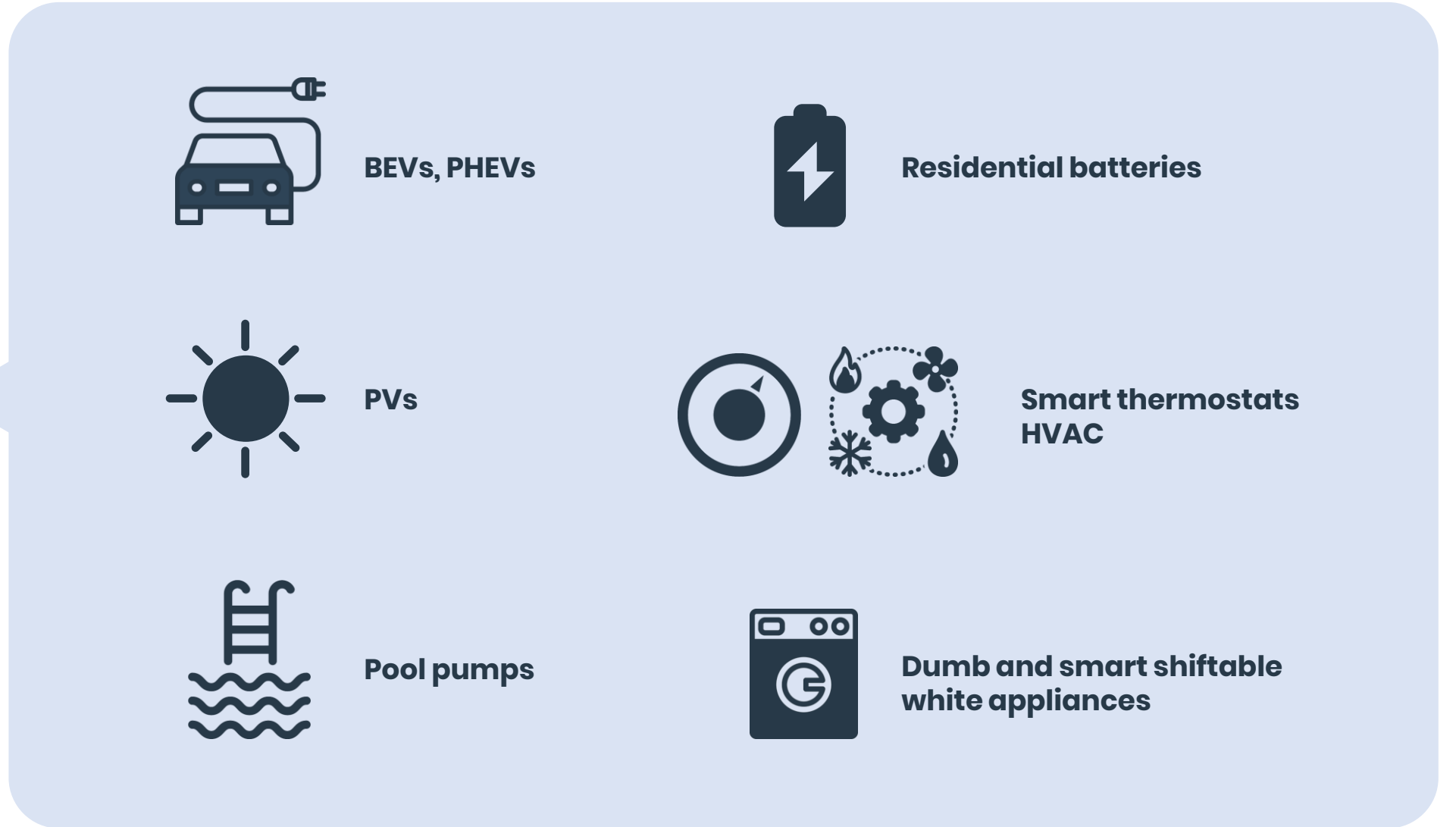
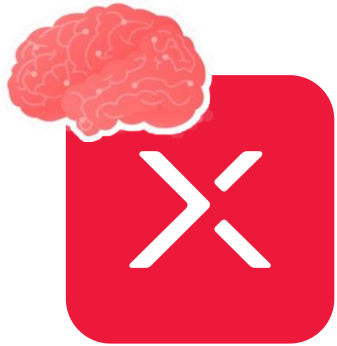
✓ **Autonomous**

✓ **Transactive ready**

✓ **Device-agnostic**



Devices integration and control



● **Device interoperability is a key hurdle which needs to be overcome to enable integration and control at scale**

Amp X – Behind the Meter Digital Energy Assistant



Device integration and control

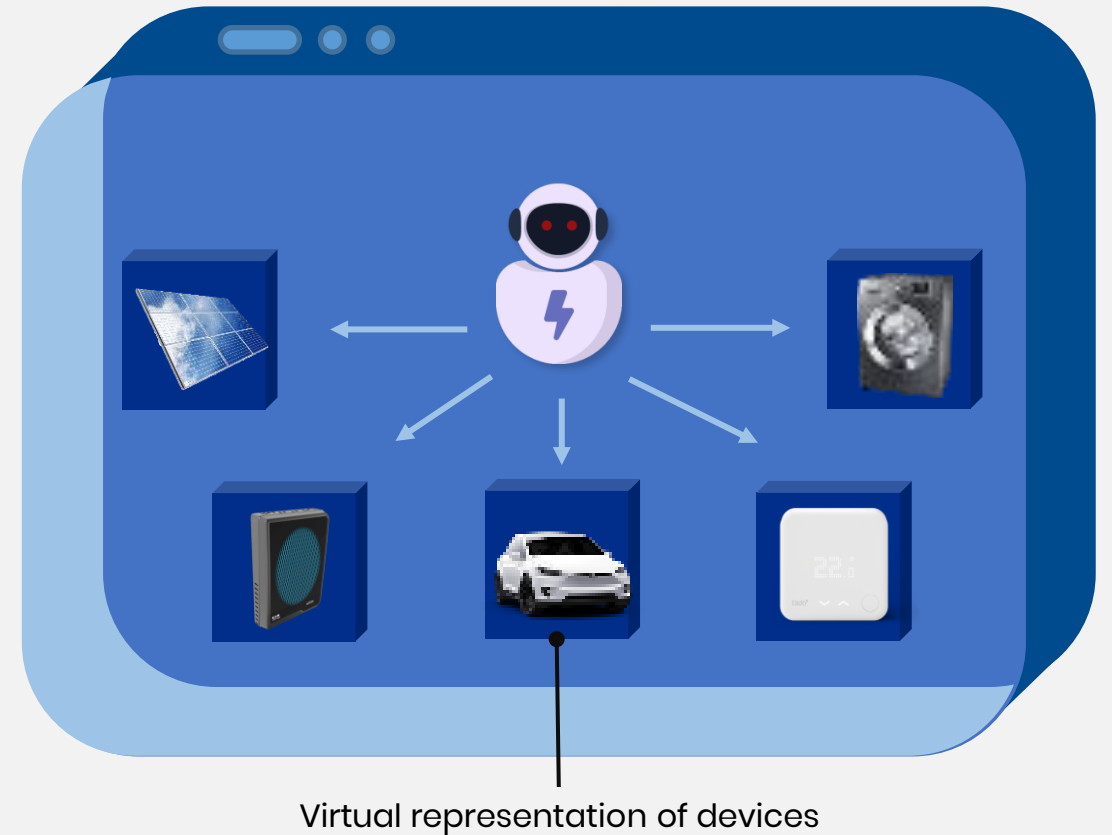
- Autonomously schedules to maximise user and grid benefits, while enhancing user comfort
- Users save (and even earn) money, with minimal effort, while providing flexibility to the grid
- Integrates PHEV, BEV, residential batteries, Smart thermostats, solar PV, pool pumps, home appliances



ALICE

Agent for Lifestyle-based
Intelligent Control of Energy

Autonomous behind-the-meter box (BMB)



2030 Vision



Markets

- Behind-the-meter flexibility to play an active role in capacity/local flexibility markets, helping to relieve grid constraints and avoid network reinforcement costs
- VPPs of behind-the-meter solar-plus-storage assets to grow significantly, delivering demand-response and enabling new business models involving utilities/retailers/aggregators/technology providers. More dynamic ToU tariffs pave the way to transactivity
- Technology-aided consumer-centric solutions to control a wide range of loads behind-the-meter, facilitated by the interoperability of devices



Amp X

- Deployment of decentralised autonomous behind-the-meter technology across key markets (UK, EU, AUS and US) through partnerships with energy retailers/aggregators/community energy players
- Focus on aggregation and management of grid-scale batteries, residential batteries, HVAC and EVs as main sources of demand flexibility, leveraging proprietary data analytics for advanced price forecasting and market participation
- Deployment of Smart Tx across key markets (U.K, EU, AUS and US) to enable LV network visibility and maximised penetration of DERs



Amp X

A technology ecosystem
to future-proof the grid

